

Case Report: Athletic Pubalgia and Core Injury. Tear/Detachment of the Right Common Adductor Longus-Rectus Abdominis Aponeurosis

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History of present illness

The patient is a 24-year-old male skier who sustained a crash resulting in acute injuries to his left knee and right groin/lower abdomen. The patient complained of left knee pain, swelling, and instability. After his crash, he was unable to ski down due to a giving out sensation in his right hip/groin. He also noted right lower abdominal pain and groin pain and described a pinching sensation along his right hip and groin. The patient had a chronic history of right lower abdominal/groin pain dating back approximately 1.5 years prior to the acute injury.

Physical examination

He was noted on physical exam with tenderness to palpation along the origin of the adductors. He had pain with resisted hip adduction and hip flexion. He had a positive right anterior hip impingement sign, negative

left anterior hip impingement sign, and negative bilateral hip posterior impingement testing. Negative bilateral hip log roll testing. Also, he noted mild lower abdominal pain with sit-ups.

Radiographs

AP pelvis and right hip radiographs were obtained. No acute pelvic fracture is identified. There was bilateral hip decreased offset at the head and neck junction. No evidence of heterotopic ossification or avulsion fracture at the adductor origins.

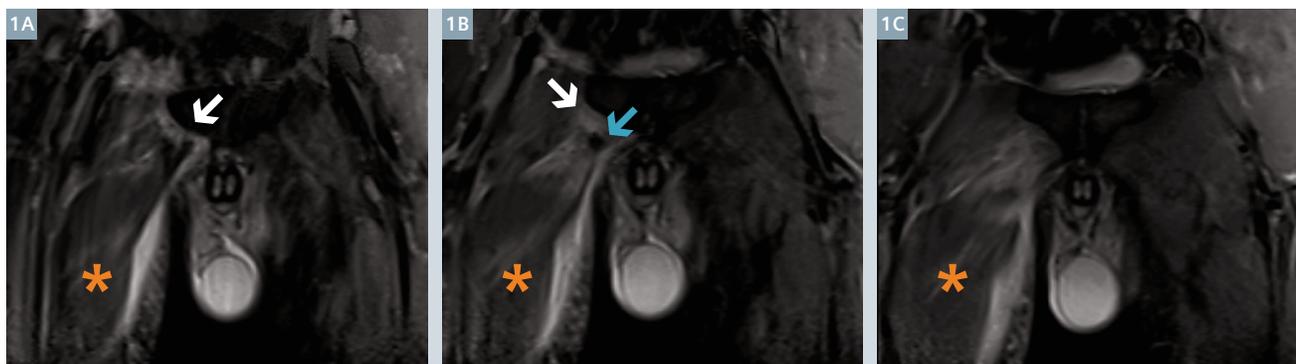
Clinical assessment

24-year-old male skier who sustained acute injuries to the right lower abdomen/groin and left knee. Injuries to the left knee based on physical exam and MRI include a complete ACL tear, lateral meniscus tear, and MCL sprain. In reference to the

patient's right lower abdominal/groin pain, there is an acute injury superimposed upon chronic right groin symptoms.

Differential diagnosis for groin pain (limited)

- Rectus abdominis muscle strain
- Adductor muscle strain, tear, and/or chronic tendinopathy
- Rectus abdominis – adductor longus aponeurosis tear
- Pelvic bone fracture / stress fracture
- Acute labral tear
- Apophysitis
- Inguinal Hernia (indirect and direct)
- Femoral Acetabular Impingement (FAI)
- Iliopsoas tendinitis
- Iliotibial band syndrome



1 Sequential coronal STIR images (large FOV) from anterior to posterior (1A-C) demonstrating edema and hemorrhage in the right adductors (*), stripping/undermining of the common adductor longus-rectus abdominis aponeurosis (white arrow), and avulsion of the adductor longus from the pubic symphysis (blue arrow).

Plan

At the patient's initial presentation, it was determined that the patient would require left knee surgery to repair his ACL and lateral meniscus. In reference to his right lower abdominal/groin pain, the treatment options included conservative treatment versus conservative therapy and obtaining additional diagnostic imaging studies. After discussion with the patient, additional MR imaging of the pubic symphysis and right hip was performed to further assess the degree of injury and narrow the treatment options.

MR imaging findings

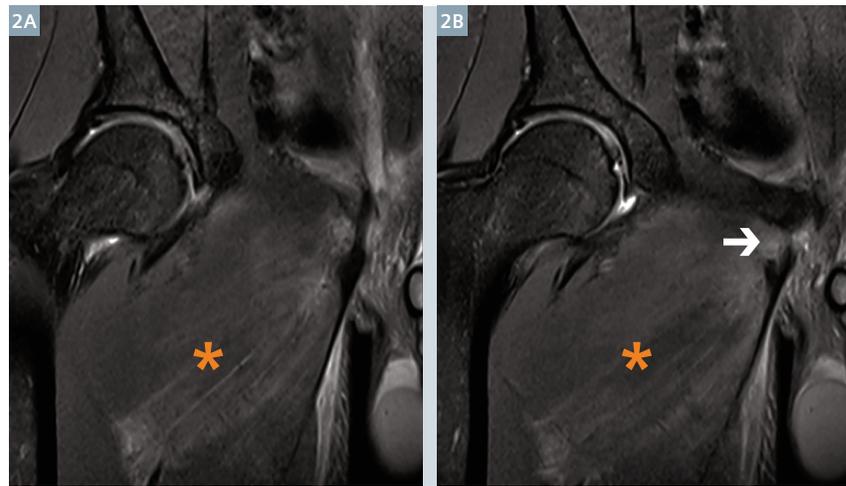
Sports Hernia Protocol:

1. Tearing and detachment of the common right adductor longus – rectus abdominis (AL-RA) aponeurosis with moderate adductor longus and distal rectus abdominis partial thickness tearing/muscle strains.
2. Moderate fluid and edema surrounding these areas along the anterior superficial soft tissues compatible with edema and contusion.

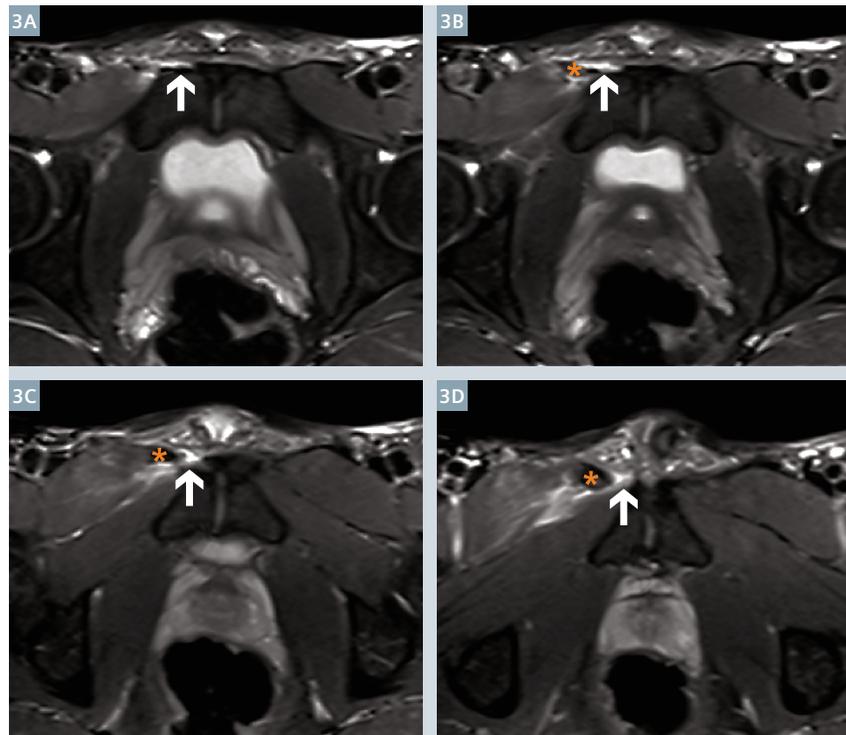
Discussion

Groin pain in athletes has long been a diagnostic and therapeutic challenge. Injuries to the groin region most commonly result from activities requiring rapid acceleration, deceleration, twisting, lateral motion, and abrupt changes in direction. Sports including soccer, American football, hockey, and baseball have been associated with particularly high rates of activity-induced groin pain, or athletic pubalgia. Up to 13% of soccer injuries involve the groin [1, 2]. Initially, sports related groin injuries were labeled 'sports hernias' secondary to the anatomic proximity to the superficial inguinal ring. However, the term 'sports hernia' is a misnomer as MRI has shown true hernias to be infrequent in this athletic population. The terms athletic pubalgia and core injury (more recently) have been used to describe this entity [6].

The pubic symphysis is an amphiarthrodial joint with an articular disc interposed between 2 pubic bones. The joint is stabilized by 4 ligaments



2 Coronal proton density TSE FS images of the right hip (small FOV) showing adductor interstitial strain/edema (*), stripping/undermining of the common adductor longus-rectus abdominis aponeurosis, and avulsion of the adductor longus from the pubic symphysis (arrow).



3 Axial T2-weighted TSE FS. Sequential images from superior to inferior (3A-D) showing stripping/undermining of the common adductor longus-rectus abdominis aponeurosis (denoted by MRI arrows) and avulsion of the adductor longus from the pubic symphysis (*).

and multiple tendon attachments. The arcuate (anterior inferior) and the superior, anterior, and posterior pubic ligaments encase the pubic articulation. The arcuate ligament and the superior pubic ligament are the strongest and most crucial for

resisting shear forces. The arcuate ligament lines the inferior margin of the pubic symphysis in close association with the articular disc and the rectus abdominis/adductor longus aponeurosis. The pubic symphysis stabilizes the anterior pelvis while

still allowing a small degree of cranio-caudal movement at the joint [3, 5].

The lower abdominal wall muscles attach to the pubic symphysis, including the rectus abdominis, internal and external obliques, and the transversus abdominis. The adductor muscles in the medial thigh also attach to the pubis and include the pectineus, adductor longus, adductor brevis, adductor magnus, and gracilis. Functionally, the rectus abdominis and the adductor longus are the most critical for stability at the anterior pelvis [3, 6]. Along the lateral margin of the pubis, the adductor longus blends with the inferior rectus abdominis attachment. At the midline, the inferior rectus abdominis, adductor fibers, arcuate ligament, and anterior pubic periosteum form the aponeurotic plate [6]. During core rotation and extension, the rectus abdominis and the adductor longus are relative antagonists. While the rectus elevates the anterior pelvis, the adductor longus depresses it. Injury of one of these two components causes abnormal biome-

chanical forces on the opposing muscles and tendons leading to further injury at the aponeurosis and its attachments [7]. Continued athletic activity in the setting of pelvic instability may result in progressive/additional injury to the surrounding structures.

Imaging features

MR imaging:

Small field-of-view high resolution MR image acquisition of the pubic symphysis is obtained in the axial, sagittal, and coronal planes using a 3T MAGNETOM Verio system. Sagittal images are most helpful in depicting the adductor longus-rectus abdominis aponeurosis. Water-sensitive sequences, such as Proton Density TSE with fat saturation, are used to detect abnormal bone marrow signal within the pubis associated with stress-related changes, avulsion injuries, bone contusion, fracture, and other inflammatory, infectious, or infiltrative processes.

Strains or small tears of the muscles and tendons are most common and demonstrate increased intramuscular and intra-tendinous signal on water-sensitive sequences. Isolated tears of the adductor longus or rectus abdominis tendons present as high MR fluid-signal filled defects in the tendons. In the acute phase, surrounding hemorrhage and edema are present. Myotendinous injuries at the pubis most commonly involve the adductor muscle group, with the adductor longus being the most commonly injured. Proximal adductor longus tendon tears at the pubis frequently extend into the common aponeurosis [8].

In the distal rectus abdominis, the lateral attachment is most frequently injured [9]. Axial images best demonstrate interruption of the distal rectus abdominis tendon just superior to its attachment to the pubis. Chronic injuries of the rectus abdominis muscle or tendon may result in muscle atrophy and asymmetry in muscle bulk.

Avulsion injuries or tears of the common AL-RA aponeurosis are seen as fluid signal interposed between the

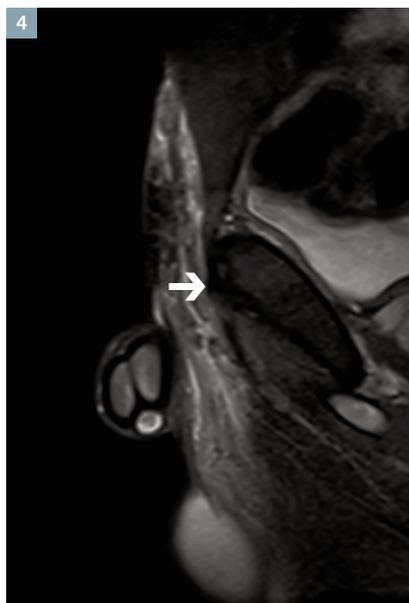
aponeurosis and subjacent bone. These injuries are best seen on sagittal MR imaging and range from small microtears to complete disruption/detachment of the common aponeurosis.

The secondary cleft sign was originally described as an arthrographic finding following injection of the symphysis pubis with abnormal inferior extension of contrast from the central symphyseal fibrocartilaginous cleft. This was felt to represent a microtear of the adductor longus and gracilis tendon origins. An MRI equivalent of the secondary cleft is visible on fluid-sensitive sequences as a curvilinear fluid-signal interface that is continuous with the symphysis pubis and undermines the inserting structures at the pubis [10]. Although the exact etiology of the secondary cleft remains to be elucidated, this most likely represents a tear of the adductor longus origin and AL-RA aponeurosis and because of the interrelated anatomy may extend bilaterally [11].

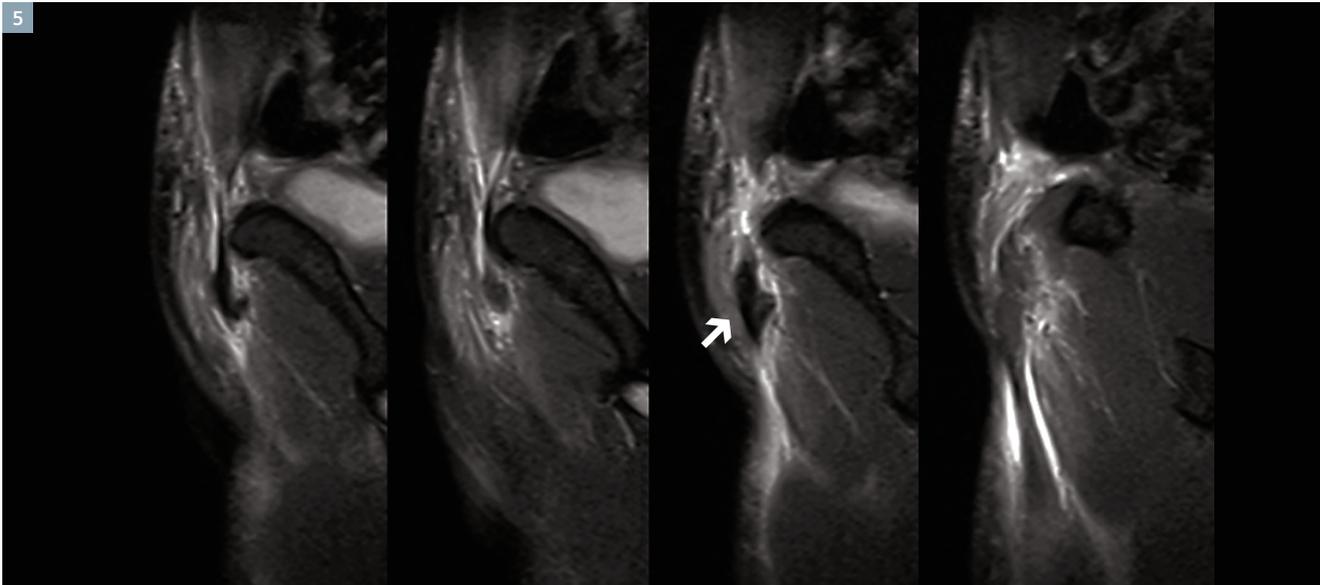
Osteitis pubis is believed to result from instability of the pubic symphysis associated with repetitive shear and distraction injuries and an imbalance of the forces applied by the inserting abdominal wall and adductor muscle groups. The earliest MR sign of osteitis pubis is diffuse subarticular marrow edema bordering the symphysis pubis. The marrow edema is typically generalized and bilateral. Additional findings representative of osteitis pubis include periostitis, bony resorption, subchondral cysts and osteophytes [8].

Treatment and prognosis

Treatment strategies for patients with groin pain are evolving, guided by an improved understanding of the biomechanics of the anterior pelvis and a more focused imaging approach. Conservative treatment is often successful with isolated tendon or myotendinous strains. In more severe injuries, steroid injections in the region of the symphysis pubis or adductor tendon origin may be utilized. However, since steroid injections do not address the underlying injury, symptoms frequently recur with resumption of athletic activities. Surgery is considered if non-operative,



4 Sagittal T2-weighted TSE FS. Left common adductor longus-rectus abdominis aponeurosis shows continuity with overlying soft tissue swelling, edema, and contusion from the contralateral right common aponeurosis injury.



5 Sagittal T2-weighted TSE FS. Right common adductor longus-rectus abdominis aponeurosis avulsion with surrounding muscle strain/hemorrhage (medial to lateral).

conservative treatment fails after 6-8 weeks. Hernia repair without a detectable hernia has reported variable success rates with either a conventional or laparoscopic approach, commonly using mesh to repair and reinforce the abdominal wall. Some authors suggest that success in these patients may result from scarring of the inserting structures in the pubic region that secondarily stabilizes the unrecognized symptomatic anatomic defect [12]. Current surgical treatment is focused on correcting the underlying anatomic defect and stabilizing the anterior pelvis, and these targeted surgical repairs have resulted in improved outcomes [12, 13]. Pelvic floor repair with reattachment of the lateral margin of the rectus abdominis tendon at the pubis has been associated with some of the highest success rates. Depending on associated injuries, adductor tendon release or tenotomy may also be performed. Isolated full-thickness adductor tendon avulsions are typically surgically reattached.

Osteitis pubis is initially managed by non-steroid anti-inflammatory drugs (NSAID) therapy and physical rehabilitation. Steroid injections are considered as the next line of therapy. Symphyseal arthrodesis is reserved for patients failing conservative measures [7].

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